Space Weather Forecast

Issued on Sunday, 07 January 2024 at 00:41 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Ongoing chance of R1 Minor Radio Blackouts. Slight chance of Minor Geomagnetic Storm G1 throughout, with full CME analyses pending. Waning chance of S1 Minor Solar Radiation Storm.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was low, with frequent low to mid-ranking Common-class flares and with a peak seen at 06/1535UTC from a sunspot region in the northwest.

There were around ten sunspot regions on the Earth-facing side, although the partitioning of groups is complex given their proximity to each other. Also complicating analyses was the fact that the majority of these sunspot regions comprised numerous small and mobile spots.

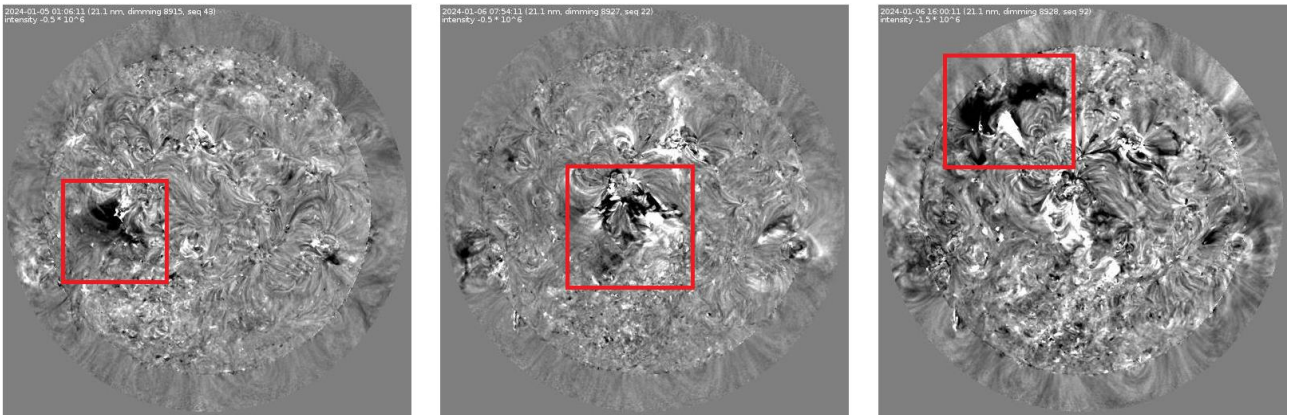

Figure 1: SIDC ROB time-integrated extreme UV coronal dimmings, associated with two possible Earth-bound CMEs and a third of interest, respectively from the southeast quadrant on 04 January; east-centre on 06 January and the northeast quadrant, also on 06 January. The first two events feature in the geomagnetic forecast, with the third awaiting imagery for analysis.

There were two main Coronal Mass Ejection (CME)-generating events observed in the 24 hours: firstly one associated with a 'filament eruption' (arc of plasma) just east of the middle of the facing side around 06/0620UTC, with ejecta visibly leaving the disc south and east of the Sun-Earth line on subsequent extreme UV imagery. Secondly, another filament eruption was seen to emerge from the northeast around N30E030 at 06/1330UTC.This event is now becoming visible in imagery, but is polluted by a concurrent far-side event at similar solar latitude. At the time of writing, only the former has been tentatively analysed. Provisionally, this CME passes the radius of Earth's orbit around the turn of the UTC day 09 into 10 January as a very slight glance, however further analyses will be sought to confirm this. Further imagery is awaited for the later CME.

A final CME seen on evening Lasco C2 imagery heading south was of uncertain source but could

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not be reconciled with any activity on the front side. Further imagery is required to confirm this.

Solar Wind / Geomagnetic Activity: Solar winds showed an apparent slow regime. The solar wind speed was at or near-background levels, with the number of particles and their associated magnetic field small-scale and unremarkable.

The net result of the above solar wind measures was for provisionally quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed: there was a continued gradual decline in proton counts in the near-Earth environment, as seen in recent days towards resting background levels in falling from near 6 to near 2pfu (i.e. below S1 or 10pfu).

Four-Day Space Weather Forecast Summary

Solar Activity: There is a level daily chance of Moderate-class flares throughout, and a slight chance of Strong-class.

Solar Wind / Geomagnetic Activity: Up to two CMEs feature at present and one fast wind regime. The most likely course of events is for the fast wind to arrive within the first 24 hours, with the northeast quadrant CME from 04 January then due in the following 24 and the second east-central CME from 06 January perhaps following after yet another 24 hours - each with decreasing confidence.

The net result is a falling Slight Chance of G1 through the four days, perhaps most reliably Quiet at the very start and end of the period.

Energetic Particles / Solar Radiation: In the absence of further proton-rich X-ray flares in prone locations, levels may be allowed to relax back to resting background before the middle of the coming UTC working week, with a chance of Minor Solar Radiation Storm S1 falling to a slight chance with time.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	20	10	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	50	50	50	50
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	25	20	20	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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